DO YOU HAVE A FRIEND WHO IS LOOKING FOR THE VERY BEST IN

SAM, Spectrum or PC

SUPPORT?

THEN TELL THEM THEY NEED

LOOK

NO FURTHER

Just send us their name and address and we will send them the details of INDUG membership and all we have to offer.

Go On, Do Your Friend A Favour - And Yourself.

INDUG

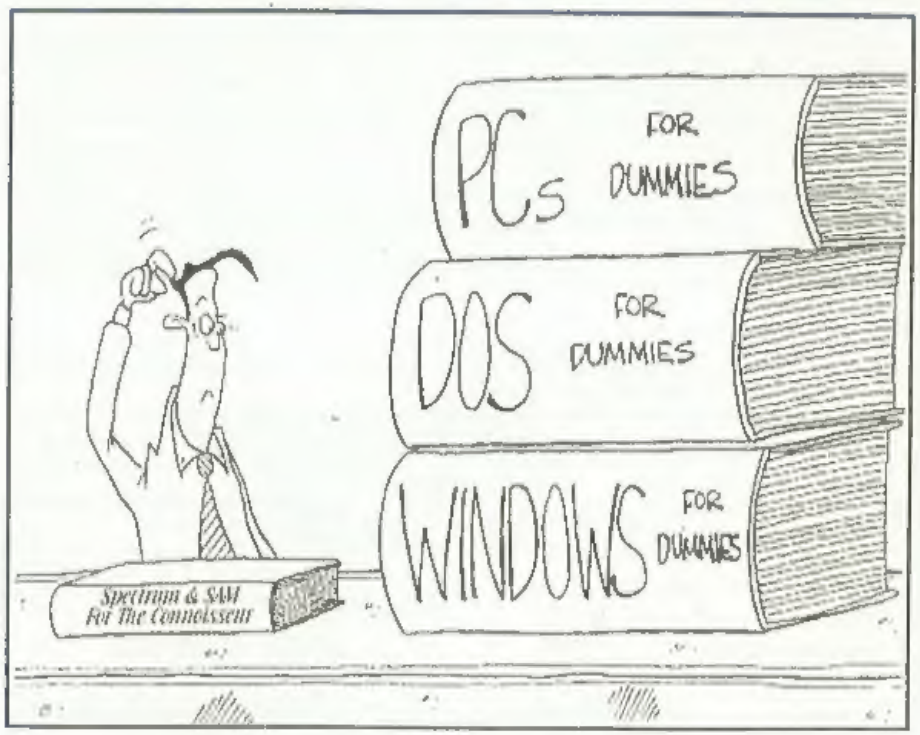
The INDEPENDENT User Group

℅ FORMAT PUBLICATIONS, 34, Bourton Road, Gloucester, GL4 0LE.
Telephone: 01452-412572. Email: FormatPub@aol.com

Vol.11 №9. May 1998.

FORMAT

THE *HOME* OF Z80 COMPUTING



It Makes You Wonder Why People Use Other Machines.

£2.00 (UK R.R.P.) ISSN 0963-8598.

SD Software

QUALITY SERIOUS SOFTWARE FOR SPECTRUM & SAM.

THE FRACTAL COLLECTION

A fast fractal generator for the ZX Spectrum. Now you can explore the fascinating world of fractals with this machine code program. Up to 200 shades on screen gives clear, crisp fractal pictures which can then be zoomed and expanded. Not just the Mandelbrot set but 18 different types can be made. Generates fractal music, you can hear the computer generate the fractal. Ready to use on disc for DISCiPLE/Plus D complete with ready-converted file for use with our SPECMAKER emulator on SAM.

SPECFILE+ The Spectrum data filing program that never gets out of date. Specfile+ holds a massive 28K of data and, by using compression makes it seem like much more. Free-format style means no complicated file design before you get started. Very fast CASE selective and complex searches. Designed to be extended - so it grows as you do. Works with PLUS D, DISCiPLE or under SpecMaker on SAM. This program is a must for anyone with data to store. *Special +3 version also available on 3" disc - add £2 to price shown below.*

UNIDOS version 2. The advanced DOS from Steve Warr for the PLUS D and DISCiPLE. Same DOS system file for BOTH interfaces. Random Access Files; Sub Directories; Hundreds of files on one disc; Hidden files; Protected files; Copy files of ANY length; Incredibly versatile Screen Dump routines; Error Trapping and MANY more features. Compatible with all Spectrums (+2a/+3 in 48K mode). Over 20 programs now included on the disc. Extra manual on using Create files also available. State DISCiPLE or PLUS D on order.

SPECMAKER The simplest Spectrum emulator on the market for SAM. 1000s of 48K programs work without the need for any conversion. Most other programs need only minor changes. All the extra SAM keys work in Spectrum mode. Uses SAM's printer port and up to 860K of SAM's memory as a RAMDISC. PLUS D, DISCiPLE and Opus discs* can be loaded into SPECMAKER and saved to SAM disc. Converts files between Messenger and SPECMAKER format to save valuable disc space. Comes with pre-converted Spectrum ROM image (no need for Spectrum). Supplied on 3.5" disc.

PC-SUITE From the same author as SPECMAKER. Now you can transfer your IBM data files by reading and writing IBM discs (720K format) on your SAM Coupé. PC-SUITE will even let you format IBM discs on your SAM. Write and edit SAM Basic programs on your PC. Use PC-SUITE to copy SAM data files to PC so you can print them on that high quality laser printer at work...

Supplied on 3.5" disc. nb. This is not a PC emulator.

As used by Format Publications to transfer articles and programs for this mag.

PRICES:	Non Members	INDUG Members
The Fractal Collection	£5.95	£4.95
Specfile+	£12.95	£9.95
UNIDOS	£25.95	£19.95
Createfile Manual	£6.50	£5.50
SpecMaker	£12.95	£9.95
PC Suite	£25.95	£19.95
File Convertor*	£5.30	£4.00
Hacker's Workbench*	£9.90	£8.50

* GDOS programs still available

Please add £0.50 postage (£1.20 outside UK)

Spectrum Owners
Don't forget to say if ordering for PLUS D or DISCiPLE and state disc size - 3.5" or 5.25" (80 track only).
INDUG MEMBERS
Don't forget your membership number if claiming discount.

S.D.Software.
c/o Format Publications,
34, Bourton Road,
Gloucester,
GL4 0LE.

STOP PRESS: The full range of SD's software and hardware will return in the next few months, if there is anything not listed above that you really need then phone Bob on 01452 412572 and he will do his best to help.

CONTENTS

Vol.11 N°9. May 1998.

- **NEWS ON 4** - Our round up of the stories that affect you. . . . 4
- **Editorial** - Recovering well, but must try harder. . . . 5
- **Short Spot** - Another bumper bundle of programming gems and interesting bibelots for the Spectrum and SAM, gathered together for your delectation and tutelage by that master of aggregation – Dr John Wase himself. . . . 7
- **Using The SAA1099** - The Philips SAA1099 Sound Chip is one of the best chips of its type ever made. Here, David Stewart takes you on a tour of the 1099's features and explains how to use the chip from SAM Basic. Complete with a extensive example program. . . 13
- **Your Letters** - Our mailbag has been bulging this month I'm pleased to say (keep it up readers, we like it this way) so here are a selection of your letters on a wide variety of subjects. . . 21
- **SAM - The Future** - Another look at where Z80 computing should be headed. Your feed-back is very much appreciated. . . 25
- **FORMAT Readers Service Page** . . 27

THIS MONTHS ADVERTISERS:-

FORMAT - SAM C SPECIAL OFFER	22
FORMAT (SAM REPAIR SERVICE)	22
INDUG	Back Cover
REVELATION SOFTWARE	10
S.D.SOFTWARE	2
WEST COAST MAIL ORDER	6

FORMAT ISSN 0963-8598

© Copyright 1998 FORMAT PUBLICATIONS. All Rights Reserved.

No part of this publication may be reproduced, in any form, without the written consent of the publisher. The purchaser of this magazine may copy program material published herein for his or her own personal use and provided that any such programs are erased if and when the purchaser disposes of this magazine in any way. While every effort is made to ensure accuracy in *FORMAT* the publisher will not be held liable for any errors or omissions. The views expressed in articles in this magazine are not necessarily those of the publisher.

FORMAT is published by FORMAT PUBLICATIONS.
34, Bourton Road, Gloucester, GL4 0LE, England.
Telephone: 01452-412572 Email: Formatpub@aol.com

NEWS ON 4

8 BIT TO CLOSE

8 BIT, the multi-format magazine published by Brian Watson, is to close after the publication of the next issue which is due out in September.

The magazine started life as 8-Bit Mart, a vehicle for users of all 8 bit computers to advertise their second-hand hardware and software to fellow users. Early issues were thin on editorial and fat of lineage adverts. However, through its nineteen issues so far the editorial content has grown to dominate each issue, and this has been its undoing.

Brian Watson's new job means he has insufficient time to devote to editing an issue, the latest issue (number 19) has taken him several months beyond his target deadline, and he feels that matters would only have worsened if he was to continue.

Brian is not disappearing from the 8 bit computer scene altogether - he will still act as publicity officer for the Independent Eight Bit Association (IEBA) and will continue his involvement with the Amstrad CPC club WACCI.

ADVENTURE '98

The annual *Adventurers Convention* will again be held at the Ariel Suite of the Royal Angus Thistle Hotel in Birmingham on October 24th this year.

The Royal Angus Thistle is in St. Chad's, Birmingham B4. This is at the end of the A38M, and easy to get to from all parts of the country.

The convention runs from 9am to around 6pm and covers all formats from Spectrums to PCs. Tables are available if you wish to bring along your own computer, something they actively encourage as they depend to a large extent on those attending to bring their computers, so the more the merrier! If anyone wishes to take hardware or software to sell you will be more than welcome to, but no pirated software please!

The annual event attracts adventure enthusiasts from all over the UK, including Northern Ireland, and the atmosphere is very friendly and informal. During the day they have a popular 'Megapoints' competition running. In this contestants get 20 minutes playing time at a specially written Spectrum text adventure, with the object of scoring as many points as possible in the allotted time. There are usually cash prizes and special certificates for the 3 highest scores. The adventure this year is being written by Ulsterman Jon Scott, author of various Spectrum text adventures published by Zenobi Software.

Tickets are available now and cost £6 per person if you buy yours before 30th June. Thereafter, or if you pay on the door on the day, the price is £7. Tickets may be purchased from: Vicky Jackson, 128 Merton Hall Road, Wimbledon, London, SW19 3PZ.

YOUR NEWS HERE...

Come on readers, we need your news. Anything related to computers which you think will interest other SAM and Spectrum owners. Just jot it down on a piece of paper, add your name and membership number, and send it off to us at the usual address. Please mark the envelope 'News' so that we can give it the priority it deserves.

Remember, you get three months extra subscription for every news item we print, so don't rely on others to send in an item you have seen - send it off yourself and earn our thanks as well.

This months credits:-

The Editor Speaks

Thank you for all your letters expressing sadness or concern about our break-in back in January, it has been very heart-warming to read them. As I said last month, I didn't want to say too much about the problem until we had sorted out the insurance, but now that is all behind us and we have got stuck into the task of sorting out the mess – and hopefully catching up.

At the moment I'm concentrating on the needs of the many (as Vulcans say) and putting all my effort into getting ***FORMAT*** out the door on schedule. It may take a couple more months but the hope is to get back to our first Tuesday of the month publishing date as soon as we can. I'm still trying to get SAM_CLOCKs built as quickly as I can, but it is slow progress. However, I'm down to the last thirty now so there is light at the end of the tunnel.

Here in the office things are beginning to look a bit better. The new laser printer is working fine, although I still miss the Richo LP1200 which had given us such good service (and had only just been repaired). If anyone has a second-hand LP1200 they want to get rid of, I would love to hear from you. The HP LJ 4P we now have is good, but it lacks the emulations the Richo had (IBM Proprinter and Epson FX) which means I can't use it on the Spectrum and SAM anymore. Still, I'm keeping my eyes peeled for one.

The change of management at Fred Publishing is still not complete, hence no advert from them again this month. If anyone does need a FRED product urgently please give me a ring and I will try to arrange something. In the meantime it is just a case of waiting for the restart.

The response to my article, in the February issue, about the future of SAM has generated a reasonable response (although I still want lots more please). Letters, emails and telephone calls are beginning to give us a picture of what the typical SAM owner (and a few Spectrum owners) want to see. I've produced an update on the situation for this months issue (see page 25) which I hope will make interesting reading. More updates as progress is made.

A number of people have asked what has happened to our regular cover artist, Jon Nixon. He has been missing for some months now and although I do my best there is certainly no substitute for Jon's covers. Well Jon has moved to The Netherlands, where he now works on software development for a multi-national company in Amsterdam.

Anyway, it now appears he, his wife Annemarie, and their wonderful daughter Emily (and I must not forget *bump*, the new *firmware* expansion to the Nixon household now under development), are settled in permanent accommodation, so he hopes the front covers should start flowing again soon. We missed you Jon, get drawing.

Until next month.

Bob Brenchley, Editor.

SAM GAMES AVAILABLE FROM REVELATION

SOPHISTRY

One of the BEST licenced games on SAM. Originally produced for the Spectrum by CRL, and now brilliantly converted for SAM, Sophistry is a game that is big, perplexing, colourful, frustrating, musical, bouncy, and above all DIFFERENT (and it even has the Spectrum version built in so you can take a trip down memory lane).

£9-95 (£8-95 to INDUG members)

T'n'T

Written by industry mega-star Matt Round - A game packed with • humour☺, colour☻, sound♪ and *above all* **ACTION!**

Loosely based on **Bomb Jack** (the game SAM owners have most requested over the years). As well as the normal one player game, **T'n'T** has gone one better by giving you ***TWO*** player action - competing against each other, in full glorious technicolour - at the *same* time. It even has a novel feature in a SAM game - a High Score Table, how many others have that?

Avoid the meanies, collect the bonus points, Jump, Hover, Fly - what more do you want???.

£9-95 (£8-95 to INDUG members)

ELITE

The legendry game at last available on SAM disc. Using the code of the Spectrum version, long thought the best after the original BBC version, this game is a must for everyone who loves action and adventure. Full manuals, story book and packaging.

£14-95 (£11-95 to INDUG members)

GRUBBING FOR GOLD

GRUBBING FOR GOLD - the most advanced, the most playable, the most enjoyable quiz game since the legendary Quiz Ball. They said it could not be done - they said bringing a TV quiz show to SAM would not work. Well let them eat their hearts out because YOU GOT IT....

Hundreds of questions, on a wide variety of subjects at levels to suit most people, it includes a question editor so you can create your own sets of questions. This is the game you can never grow out of.

£9-95 (£8-95 to INDUG members)

More Games Coming Soon

Send SAE for full list of available games.

REVELATION FOR THE *VERY BEST* IN SERIOUS SOFTWARE

➢ **THE SECRETARY (Version 1.5)** - The most advanced and the most widely used word-processor for SAM, powerful, versatile and easy to use. **£14.95 (INDUG £12.95)**

➢ **COMET Z80 ASSEMBLER** - The SAM assembler many professionals use, yet easy enough for the beginner - so why settle for second best? *New LOW Price* **£14.95 (INDUG £12.95)**

DRiVER
The Graphical User Interface for SAM

DRiVER works with the SAM Mouse (no mouse should be without one) or Keyboard. It provides a full WIMP (Windows, Icons, Menus, Pointers) system that puts you in full control of your SAM. Comes complete with many built-in utilities and ready to run applications. Full manual and a disc-based tutorial. DRiVER gives you the ease of use only found on big office computers before. So easy to use yet so powerful. ***Fantastic Value £29.95*** (INDUG members ***£24.95***)

Now Includes FREE Copy Of DRiVER's Extras Disc 1

DRiVER's Extras Disc still available for existing users at £5.95 (INDUG members £4.95)

SCADs PD Yes, at last, we are pleased to re-release SCADs - the arcade game development system for SAM. Previously sold by Glenco at £24.95 we have now placed the software into the Public Domain so the disc costs you ***Only £2.50***. The full manual (over 200 pages) is also available for £12.95 (overseas please add an extra £1 to postage rates below because of weight)

- All prices include UK postage and packing (Europe please add £1, other overseas please add £2).
- Payment by UK cheque (made payable to Revelation Software), PO or cash. Sorry but we can't accept Euro-cheque or Giro.
- Please Quote INDUG membership number clearly on order if claiming discount.
- Send orders to:-

Revelation Software

Revelation Software, 45, Buddle Lane, Exeter, EX4 1JS.

SHORT • SPOT

YOUR HINTS, TIPS AND PROGRAMMING IDEAS

Edited By:- John Wase.

It's time for May's Short Spot, and time for my cockups again. In January, I included in my copy to Bob a program found by Dean Brady in one of the last issues of ZX Computing. It was a short piece of machine code with a Basic demo, and the title of the demo was 'pull-down menu'. Bob kept it back because he had enough stuff without it, anyway, but, more seriously, because the two lines of code to produce the magic effect were missing. As I feel sure it is of interest to lots of programmers for the effects it produces, I looked for it again this month, but couldn't find the original disc. The second program is rather similar: it is supposed to work with a Multiface, looks for fancy fonts, and loads two code files, which may come with Multiface, or they may come separately. Can Dean please shed any light on these, as I feel sure such effects are great for other programmers, and please could he send me another disc, with the code files in a way that we can print them. *Perleaze!* Many thanks.

Next, we have some stuff by our evergreen correspondent, Miles Kinloch of Edinburgh. Although it is specifically written for the Spectrum/PLUS D combination, it is particularly interesting because of its general implications. Firstly, I want to mention that I am especially grateful to Miles for being so understanding, for the first thing of his I opened was a letter of 30th November last year, in which he mentioned a really ingeneous program he'd written (well; it would be, knowing Miles), and had clearly sent me in a recent letter, and I hadn't got it and couldn't find it. Fortunately, realising what had happened, his letter of 18th January contained reprints and all the necessary, so here we are. Bless you for being so understanding, Miles.

His first reprinted letter of 20th November contains two main points. In the first, he mentions that while experimenting recently with the Betados facility to create extended directory formats, he discovered that things go wrong when the file capacity specified exceeds 255, affecting the catalogue display and file position referencing. Miles traced the cause to the fact that the DOS uses a single-byte system variable (at location 15874) for the directory slot number, which, although adequate for the 80-file format for which it was designed, can cope only with a maximum possible value of 255. Since to substitute a two-byte system variable would involve extensive reprogramming of the DOS, and since a practical limit of 240 files (the nearest value corresponding to a complete set of directory tracks) still offers a generous capacity, the easiest way may be just to accept these contraints and POKE the DOS to restrict the range of the FORMAT parameter.

To recap; the maximum number of directory tracks is currently 39, representing 780 files. A disc would be formatted in this way, using **FORMAT d1,n** where 'n' is the number of directory tracks in the format; in this case 39. With any higher number, an 'Integer out of range' error would occur. To set a maximum size of 240 files, then, we would want to reduce the highest permitted value for 'n' to 12, and this can

be achieved by altering the DOS as follows:-

```
10 CLEAR 4e4
20 LOAD d1"+sys Beta" CODE 409
   60
30 POKE 46415,9
40 SAVE d1"+sys Beta" CODE 409
   60,6850
```

From the point of view of BETAFIX, it makes no difference whether this modification is carried out before or after applying the latter. To test afterwards, boot the amended DOS and try **FORMAT d1,13**. You should see an 'Integer out of range' report. Now try **FORMAT d1,12**. This time, the command should be accepted, giving a disc of 240 files capacity if you proceed with the format.

So far, so good. This, however, leads us on to a further matter which has an application far wider. Again, it concerns formatting. *This is a trick which should work with any DOS, provided a DS/DD drive is in use.* Although the maximum number of tracks is officially 160 (i.e. 0-79 and 128-207), in practice, an extra track can usually be squeezed into each side, opening up some intriguing possibilities. To create these extra tracks, enter **POKE @1,209** (or **POKE @2,209** for drive 2) and format the disc in the usual way. (Don't forget to **POKE @1/@2,208** again afterwards, or reboot.)

The new tracks have interesting properties that could usefully be exploited by anyone wishing to expand on this idea. A further important point (just watch this carefully) is that *being isolated from and independent of normal DOS operations, they are unaffected by normal reformatting, etc., and to all intents and purposes are completely hidden from the DOS.* Any data stored, therefore, remains intact, and can therefore be changed only through SAVE @, or erased by reformatting under a 209-track POKE. Disc copying programs, including sector copiers, also ignore the extra tracks, making it possible, for example, to distinguish an original disc from a copied clone.

On the other hand, if you *do* wish to copy the new tracks from one disc to another, for Betados, use the following program, remembering to format the destination disc appropriately beforehand.

```
10 CLEAR 29999
20 LOAD @1,80,1,30000,10:
   REM Load track 80, disc 1
30 LOAD @1,208,1,40000,10:
   REM Load track 208, disc 1
40 SAVE @2,80,1,30000,10:
   Rem Save track 80, disc 2
50 SAVE @2,208,1,40000:
   REM Save track 208, disc 2
```

Or, for G+DOS:-

```
10 CLEAR 29999
20 REM Load track 80, drive,1
30 LET a=30000: FOR s=1 TO 10
40 LOAD @1,80,s,a
50 LET a=a+512: REM New addres
   s for next sector
60 NEXT s
70 REM Load track 208, drive 1
80 LET a=40000: FOR s=1 TO 10
90 LOAD @1,208,s,a
100 LET a=a+512: REM New addres
    s for next sector
110 NEXT s
120 REM Save track 80, drive 2
130 LET a=30000: FOR s=1 TO 10
140 SAVE @2,80,s,a
150 LET a=a+512: REM New addres
    s for next sector
160 NEXT s
170 REM Save track 208, drive 2
180 LET a=40000: FOR s=1 TO 10
190 SAVE @2,208,s,a
200 LET a=a+512: REM New addres
    s for next sector
210 NEXT s
```

The new tracks are numbered 80 and 208, and can be read/written accordingly, using the **LOAD @** and **SAVE @** commands. With Betados, the multi-sector versions of these commands have the advantage of conveniently

allowing the entire track to be loaded or saved in one operation, whereas with G+DOS, each sector has to be accessed individually.

Miles writes that he has tried this technique on dozens of discs and has yet to see it fail, though one extra track per side does seem to be a hard and fast limit. This is a pity, as with four tracks instead of two, one would have been able to create a duplicate copy of the directory - the ideal precaution against a sector error there. Finally, Miles has sent me a little demonstration. It's a Betados 300-file format disc, with cat printouts, which have demonstrated to me very clearly the effects of the BDOS bug. While this is of interest to those who regularly use Betados, of more general interest is the second demonstration also enclosed on the same disc. This has, of course, the extra two tracks, and on these, Miles has saved a screen. To make this work, all you do is:-

```
10 LOAD @1,80,116384,10
20 LOAD @1,208.1.21504.4
```

Now the really interesting part. Reformat the disc in the usual way, run the program again, and the screen is still there! (N.B. Do this in 48K mode, as a screen represents 13.5 sectors, and 14 sectors therefore need to be loaded, overwriting the printer buffer!!!)

NOW think of some uses for this! You could, for instance, have a section of code that could be accessed only by a restricted bit of the program, giving you all sorts of possibilities. The important point is that this has very general application.

Next, here's a little routine Miles wrote to demonstrate a hypothetical application for the 'hidden tracks' idea. This is probably of little practical use these days, given the decline in demand for commercial Spectrum software, but Miles thought the idea itself may be of interest as it illustrates a possible technique. The secret of its success would have lain in the success of its secret, as it were, since the key to its effectiveness would have been unawareness of the mechanism rather than any inherent technical obstacles to be overcome.

As the name suggests, 'ANTICOPY' prevents a working copy of a program being made on any medium other than the original disc on which it was supplied. It does this by testing for the presence of track 80, and then carries out a further check on the first 20 bytes of its first sector, which must add up to a specified checksum. Only the low-byte is tested; i.e. the checksum value is modulo 256. To allow the tracks to be used simultaneously for other purposes, the value can be altered to suit existing data.

If the copy is run on a system without a PLUS D or DISCiPLE attached, the first hurdle of Command Code 63 will cause it to fail. Should it get this far, but find track 80 does not exist, or contains a wrong checksum, the routine will then print a warning message and reset the system on the next keypress.

To disguise their appearance, the characters in this message all have BIT 7 set. Further, anti-hacking measures include calls to the Spectrum ROM via RST 16 DW nnnnn, which are unlikely to be displayed as such by most disassemblers, while the shadow RAM is also reset to prevent a snapshot being made at this stage. If the routine were being used seriously, the code could, in addition, be saved to auto-run, thus eliminating the tell-tale USR call. . . However, as it's only an academic exercise, Miles has promised to avoid getting too carried away!

Here we are then, with clone proof protection, and anticopy disc formatter! Type them in and give them a try!

```
10 REM CLONE-PROOF PROTECTION
20 REM
30 REM AN EXAMPLE APPLICATION
40 REM FOR HIDDEN TRACKS IDEA
```

```
 50 REM By Miles Kinloch, 1997
 70 REM
 80 BORDER 1: CLEAR 59999: GOSU
    B 120
 90 PRINT "ANTICOPY ROUTINE"'''
    (113 BYTES RELOCATABLE CODE
    ,"'"CURRENTLY AT ADDRESS 60
    000.)"''"ACTION:"''"PRINTS
    THE MESSAGE 'THIS COPY ISNO
    T AUTHORISED' AND RESETS TH
    E  SPECTRUM AND +D.WORKS WI
    TH G+DOSAND BETADOS, AND SH
    OULD ALSO BE OK ON UNIDOS &
     DISCIPLE (THOUGH NOT TESTE
    D ON THESE)."''"TEST CRITER
    IA: THE ORIGINAL DISCMUST B
    E OF THE STANDARD, DOUBLE-S
    IDED DOUBLE-DENSITY TYPE, F
    ORM-ATTED WITH A TRACKS POK
    E (@1/@2)OF 209. THE FIRST
    20 BYTES IN   SECTOR 80:1 M
    UST ALSO ADD UP TO A CHECKS
    UM OF 100. THIS VALUE ISIN
    START+24 & CAN BE CHANGED."
100 PRINT #0; AT 0,0;"PRESS 'T'
     TO TEST ROUTINE, ANY  OTHE
    R KEY TO SAVE MACHINE CODE.
    ": PAUSE 0: IF INKEY$="T" O
    R INKEY$="t" THEN RANDOMIZE
     USR 60000: CLS : PRINT "
     TEST PASSED - GENUINE COPY
    ": STOP
110 SAVE d*"Anticopy.c"CODE 600
    00,113: STOP
120 REM Code Poker
130 RESTORE : LET c=0: FOR a=60
    000 TO 60112: READ b: POKE
    a,b: LET c=c+b*(a<>60024):
    NEXT a: IF c<>14721 THEN PR
    INT "ERROR IN DATA!": STOP
140 RETURN
150 DATA 17,1,80,207,63,118,205
    ,82,0,59,59,209
160 DATA 56,12,1,0,20,207,60,12
    9,79,16,250,254
170 DATA 100: REM Checksum byte
    - may be changed if desired
180 DATA 200,243,213,207,71,215
    ,107,13,62,2,215
190 DATA 1,22,225,17,71,0,25,12
    6,254,255,40,12
200 DATA 254,32,40,2,230,95,215
    ,242,21,35,24,239
210 DATA 33,255,63,54,0,43,124,
    183,32,249,175,219
220 DATA 254,31,56,250,205,80,0
    ,199,32,32,244,232
230 DATA 233,243,32,227,239,240
    ,249,32,233,243,32,238
240 DATA 239,244,32,225,245,244
    ,232,239,242,233,243,229
250 DATA 228,32,32,32,255
9999 SAVE d*"ANTICOPY" LINE 10
```

And here is the second program:-

```
 10 REM ANTICOPY DISC FORMATTER
 20 CLS
 40 INPUT "Which drive? ";d: IF
     d<>1 AND d<>2 THEN GOTO 40
 50 INPUT "Check byte? (Default
    =100) ";b: IF b<0 OR b>255
    THEN GOTO 50
 60 POKE @d,209: FORMAT dd: POK
    E @d,208
 70 POKE 16384,b: SAVE @d,'80,1,
    16384
 80 STOP
9999 SAVE d*"FORMATTER" LINE 10
```

Many thanks, Miles.

You thought I'd finished with Miles, didn't you, but I haven't. He's been quite prolific over the last few months, and for that I am extremely grateful. He's sent a ZX81 emulator to keep me amused, though, unfortunately, it doesn't lend itself to distribution as a printed copy, although it's PD. Pity. But what did meet my eye was a routine for the Multiface. Funny; it seems to be in vogue again, after all this time. Anyway, don't forget Dean's program will be on the way, and meanwhile, to keep your whistle whetted, as it were, Miles can make the Multiface Ram accessible just for you, so that you can store stuff in it - without even any knowledge of machine code, which is pretty cool.

It's called 'MULTIDUMP', and exists in two forms; one for Multiface 3 and one for all other versions of the device, including the Multiprint. To use it, first of all, ensure that the interface is enabled, then

just follow the on-screen prompts. After the code has been stored, pressing the red button will 'dump' the code to the Spectrum RAM at the address specified. Possible applications could include storing fonts, says Miles, so I wonder if it's much the same program we're waiting for from Dean. Be interesting to get his information. Miles also suggests storing UDGs and SCREEN$ (screen-resident utilities, especially). Care must be exercised, however, with 128 Basic, as the code will be placed in the current RAM page i.e. RAM 7 in the 128 Editor. This will probably not be the intention, so when the code destination is above 49152, enter PAUSE 0 and press the button while the Spectrum is pausing - this puts the code into normal RAM 0.

Here we are, then; 'Multidump':-

```
 10 REM       MULTIDUMP 1
 20 REM (PD) by Miles Kinloch
 30 REM Multiface 1/128, Discip
    le Multiface 128 & Multipri
    nt machine code storage.
 50 REM Syntax at line 240 may
    be changed for +D/Disciple
    etc.
 60 CLEAR 44999: GOSUB 1000
100 INPUT "Are you using the Di
    sciple      version of Mult
    iface 128 (Y/N)? "; LINE b$
    : IF b$="Y" OR b$="y" THEN
    LET i=191: LET o=63: GOTO 1
    80
110 IF b$<>"N" AND b$<>"n" THEN
     BEEP .8,-25: GOTO 100
150 INPUT "Store the code in (1
    ) Multiface or (2) Multipri
    nt memory ? "; LINE c$: IF
    c$="1" THEN PRINT "STORE CO
    DE IN MULTIFACE": LET i=159
    : LET o=31: GOTO 180
160 IF c$="2" THEN PRINT "STORE
     CODE IN MULTIPRINT": LET i
    =187: LET o=191: GOTO 180
170 BEEP .8,-25: GOTO 150
180 INPUT "Input the address to
     which you  want the code t
    o be dumped:"'start: IF sta
    rt<16384 OR start>65535 OR
    start<>INT start THEN BEEP
    .8,-25: GOTO 180
190 PRINT '"DUMP CODE TO ADDRE
    SS ";start
200 INPUT "Length (max. 7734 by
    tes) of the code ? ";length
    : IF length<1 OR length>773
    4 OR length<>INT length THE
    N BEEP .8,-25: GOTO 200
210 PRINT ''length;" BYTES"''
220 INPUT "Filename ? "; LINE n
    $: IF LEN n$>10 THEN BEEP .
    8,-25: GOTO 220
230 PRINT #0; AT 0,0;"LOADING "
    ;n$;" " AND LEN n$;"CODE...
    "
240 LOAD n$CODE 50000,length
250 POKE 45002,i: POKE 45056,o
260 LET hi=INT (start/256): LET
     lo=start-256*hi: POKE 4506
    4,lo: POKE 45065,hi
270 LET hi=INT (length/256): LE
    T lo=length-256*hi: POKE 45
    051,lo: POKE 45052,hi: POKE
     45067,lo: POKE 45068,hi
280 RANDOMIZE USR 45000
290 PRINT '''''' FLASH 1; BRIGH
    T 1;"CODE STORED"
300 STOP
1000 REM Code Poker
1010 LET c=0: FOR a=45000 TO 450
    79: READ d: POKE a,d: LET c
    =c+d: NEXT a: IF c<>6977 TH
    EN PRINT "ERROR IN DATA!":
    STOP
1020 RETURN
1030 DATA 243,219,159,33,0,32,68
    ,77,54,0
1040 DATA 35,11,121,176,32,248,3
    3,0,32,54
1050 DATA 0,35,54,33,35,54,255,3
    5,54,82
1060 DATA 35,54,85,35,54,78,33,3
    ,176,17
1070 DATA 0,33,1,21,0,237,176,33
    ,80,195
1080 DATA 1,0,0,237,176,219,31,2
    51,201,243
1090 DATA 33,21,33,17,0,0,1,0,0,
    237
1100 DATA 176,219,254,230,31,238
```

```
    ,31,40,248,199
9999 SAVE d*"MULTIDUMP1" LINE 10
```

Here is the Multiface 3 version:-

```
 10 REM       MULTIDUMP 3
 15 REM  (PD) by Miles Kinloch
 30 REM Multiface 3 machine cod
    e storage.
 40 CLEAR 44999: GOSUB 1000
180 INPUT "Input the address to
     which you  want the code t
    o be dumped:"'start: IF sta
    rt<16384 OR start>65535 OR
    start<>INT start THEN BEEP
    .8,-25: GOTO 180
190 PRINT '''"DUMP CODE TO ADDRE
    SS ";start
200 INPUT "Length (max. 6584 by
    tes) of the code ? ";length
    : IF length<1 OR length>658
    4 OR length<>INT length THE
    N BEEP .8,-25: GOTO 200
210 PRINT '''length;" BYTES"''
220 INPUT "Filename (specify dr
    ive letter  if other than d
    efault drive to  be used):
    "; LINE n$
230 PRINT #0; AT 0,0;"LOADING "
    ;n$;" " AND LEN n$;"CODE."
240 LOAD n$CODE 50000,length
260 LET hi=INT (start/256): LET
     lo=start-256*hi: POKE 4506
    4,lo: POKE 45065,hi
270 LET hi=INT (length/256): LE
    T lo=length-256*hi: POKE 45
    051,lo: POKE 45052,hi: POKE
     45067,lo: POKE 45068,hi
280 RANDOMIZE USR 45000
290 PRINT '''''' FLASH 1; BRIGH
    T 1;"CODE STORED"
300 STOP
1000 REM Code Poker
1010 LET c=0: FOR a=45000 TO 450
    79: READ d: POKE a,d: LET c
    =c+d: NEXT a: IF c<>6834 TH
    EN PRINT "ERROR IN DATA!":
    STOP
1020 RETURN
1030 DATA 243,219,63,33,0,32,68,
    77,54,0
1040 DATA 35,11,121,176,32,248,3
    3,0,32,54
1050 DATA 11,35,54,38,35,54,0,35
    ,54,82
1060 DATA 35,54,85,35,54,78,33,3
    ,176,17
1070 DATA 11,38,1,21,0,237,176,3
    3,80,195
1080 DATA 1,0,0,237,176,219,191,
    251,201,243
1090 DATA 33,32,38,17,0,0,1,0,0,
    237
1100 DATA 176,219,254,230,31,238
    ,31,40,248,199
9999 SAVE d*"MULTIDUMP3" LINE 10
```

Well, that's all of Miles' stuff I can squeeze in now. All of us Spectrum users owe Miles a big debt - he always manages to produce something fresh and original, and does it time and time again. Many thanks for your consistent stream of interesting material, Miles, and long may it continue. Oh, and thanks for your good wishes, which are gratefully received.

I've still got some more of Miles' stuff, so we can have more original Speccyfixes another time. Once again, thanks.

All right, this Short Spot has been primarily for PLUS D experts, but it's pretty obvious that the same principles apply to the SAM, isn't it. These principles, and therefore these programs should be easily changeable to SAM format, shouldn't they; after all, the format is essentially the same, so you've only got to change the **POKE @** statements and one or two other bits and pieces... So who's going to do it for us, then?

Please keep all your snippets coming to me (you're very good; please keep it up!); without them I can't put a column together.

Please send them to:-

John Wase,
Green Leys Cottage,
Bishampton,
Pershore,
Worcs,
WR10 2LX.

See you next month.

Using The SAA1099 Sound Chip

By:- David Stewart.

Most people's first encounter with SAM's music capabilities is when they listen to the MGT Anthem on the demo disc. For anyone use to the Spectrum BEEP it's amazing. It demonstrates the effects that can be obtained from a Basic program and the much-publicised, six-channel, stereo sound chip.

When I first obtained my SAM I remember being very disappointed with the three-page chapter 8 - the section on *Sound Effects*, and had to wait until the SAM Technical Manual arrived. In the meantime I played around with the Anthem program and got SAM to play a few tunes - although I had no idea how it was doing it!

So, armed with the Tech manual I began to investigate the Philips SAA1099 Sound Chip.

On the whole, control of the chip is straightforward and the following text, together with a number of demonstration procedures should help you understand it.

Unfortunately, the overhead in calling the demo procedures makes writing something like the MGT Anthem with them almost impossible as they are too slow. The best results will come off dedicated programs or better still, a set of machine code extensions. Meanwhile...

THE SOUND COMMAND

The user guide says: "Advanced programmers can use the command SOUND to send special codes to the sound chip. It routes data bytes 'd' to individual sound chip registers 'r', and up to 127 pairs of such numbers can be used. . ." ie., **SOUND register,data.**

All that is missing is what the registers control and their data values! Briefly, there are 32 registers (although 11 are unused) falling into six or so 'groups'. The associated data values are all 8-bit (they range from 0 to 255). Sending data to the chip is one-way – you can't READ the current register settings. Depending on your application, you may need to keep a record somewhere. This is extensively done in the demo routines later in this article.

ENABLE CONTROLS

Before we can produce any sounds the SAA1099 has to be enabled.

CHIP ENABLE – Register number 28, controls this feature. Writing a zero to it disables the chip, and sending a one enables it. If you're playing some notes and execute SOUND 28,0 then everything goes quiet – very useful when a routine crashes part way through. A later SOUND 28,1 will result in sound being heard again.

See the procedures CHIPON and CHIPOFF later.

It is possible to reset the chip by adding two to the above ie. SOUND 28,3 resets all channels, and enables the chip.

TONE ENABLE – Register 20. As well as needing to enable the actual chip, we also have to specify which channels we wish to hear. This is controlled by register number 20. The data has the

binary form BIN xx543210 where 1 switches the respective channel on and 0 switches it off, e.g. SOUND 20,BIN 00101010 turns on channels 1,3 and 5, and switches 0, 2 and 4 off *[The xx in position 7 and 6 is unimportant here].* The procedures within demo routines at the end of this article allow selective channels to be switched on or off - a record of the current status is kept. See procedures ENABLE and DISABLE

NOISE ENABLE – Register 21. This determines which channels will have a noise component added. The way to use it is identical to register 20, where a '1' means add the noise, a '0' means don't. See NOISEON and NOISEOFF for examples.

VOLUME CONTROL – Volume is controlled by Registers 0 to 5, which correspond to channels 0 to 5. There are 15 settings ranging from 0 (silence) to 15 (max). Additionally, each channel has an independent 'left' and 'right' volume part-stereo. Both settings are encoded into the data byte: in binary it has the form BIN rrrrllll. In Basic speak that's right volume * 16 + left volume. One point to remember is that while SOUND 0,15 may sound like full volume on a mono tv, the stereo output is rather lopsided (see VOLUME procedure).

TONE CONTROL – Tone (or note, or pitch) is controlled by Registers 8 to 13, again corresponding again to channels 0 through 5. There are 256 possible tones in any octave, with the tones corresponding to musical notes as shown in the table in Fig.1.

SOUND 10,192 plays note G on channel 2. In the program see procedures NOTEVALUES and NOTE.

OCTAVE CONTROL. Things are a little more complex with octave control because each register controls two

NOTE	VALUE	NOTE	VALUE
B	5		
C	33	C#	61
D	85	D#	109
E	132		
F	153	F#	173
G	192	G#	210
A	227	A#	243

Fig.1.

channels. Register 16 controls channels 0 and 1, 17 controls 2 and 3, and 18 controls channels 4 and 5.

There are 8 different octaves, number 0 being lowest and 7 highest. Middle C is located in octave 3. Since two octaves are encoded into each data byte, a record of previous values may be desirable, - although if you use three channels or less you can avoid this problem.

In binary the data looks like BIN x555x444, where 555 and 444 are the binary octave values for channels 4 and 5 (therefore Register 18). The other two registers have an identical format. x means the bit could be 0 or 1 - in other words a *don't care*. In Basic-speak that's octave channel 5*16 + octave channel 4.

SOUND 17,bin 00110100 sets channel 3 to octave 3 and channel 2 to octave 4. In the program, look at the procedure OCTAVE.

There is a potential problem when making tone and octave changes. To illustrate, imagine playing tone 'C' in octave 3. We want to switch to note 'G' in octave 2. We could set the new octave, then the new note, but in the process of the change there will be a brief period when 'C' in octave 2 is heard. The SAA1099 provides a solution to this problem - when a new tone is written there is a short delay before the new

setting is acted upon. This allows time for the software to output a new octave setting. In slightly technical terms, the note and frequency must be changed within half the period of the current frequency. If you were sounding 31Hz (the lowest) tone, you have 0. 017 seconds for the change but with a 7. 74kHz tone you only get 64us! A SOUND command sequence or direct machine code access will work this quickly. With the Basic procedures within my example program, you don't stand a chance!! In other words, if you change the note and octave fast enough, you won't hear a thing! (For the mechanisim to work,the NOTE must be written first then the OCTAVE.)

NOISE. Random noise can be sounded on any of the six channels - with or without a musical note. There are two noise generators, the first (0) for channels 0,1 and 2, and the second (1) for channels 3,4 and 5. Each noise generator has 3 fixed frequency settings, and one programmable one. The frequency of the fourth mode is derived from the tone and octave of channels 0 and 3 for generators 0 and 1.

The formula:-

frequency(Hz)=(15625x2↑octave)/(511-tone)

calculates the exact frequency from tone and octave settings of channels 0 and 3.

If you want noise (or a musical tone) of a specific frequency, you can calculate the required tone and octave settings. The noise generators are controlled by register 22. In binary, the data has the form BIN xxAAxxBB where AA is the setting for generator 1, BB for generator 0. In Basic, use generator 1 * 16 + generator 2 Where generator 1/2 have the values shown in Fig.2.

See the procedures NOISEZERO and NOISEONE for an example.

VALUE	NOISE FREQUENCY
0	31. 25 kHz
1	15. 6 kHz
2	7. 8 kHz
3	Channel 0 or 3 control giving 61Hz to 15. 6 kHz

Fig.2.

ENVELOPE CONTROL. When MGT first described the sound capabilities of the SAM, I expected to have six different instruments playing in full stereo. Wrong! While it would be possible to make the SAA1099 sound like a piano or trumpet, built-in envelope control is limited to eight basic waveforms operating on two channels - 2 and 5.

Register 24 controls the envelope for channel 2, Register 25 the envelope for

BIT	VALUE	FUNCTION
0	0	identical - left/right
0	1	inverse L/R components
321	000	zero amplitude
	001	maximum amplitude
	010	single decay
	011	repetitive decay
	100	single triangular
	101	repetitive triangle
	110	single attack
	111	repetitive attack
4	0	4-bit resolution
	1	3-bit resolution
5	0	internal clock
	1	external clock
6	x	unused
7	0	off>envelope control
	1	on >envelope control

Fig.3. Envelope Register Bit Allocation

channel 5. The format of the data byte is rather complex, so I've reproduced the table in Fig.3 from the SAM Technical Manual (*available from Format Publications, see the FRS page.* **Ed.**)

The least significant bit (bit 0) determines whether the sound will be identical on the left and right parts of the channel ie., identical volumes or whether they will be inverse - the volume on one side falls while the other rises perhaps.

The next three bits (1, 2 and 3) control the envelope type.

Bit 4 controls the resolution of the envelope - in other words, the number of volume changes from the highest to lowest. The three bit resolution is coarser (bigger steps). Bit 5 tells the envelope from where to derive it's clock frequency. If set to 1, an external clock is used. The technical manual says: "When an external envelope clock is selected, an envelope is only created when address 24 or 25 is written to (that is, when A0 is set to 1 and there is a 'write 24 or 25' command)." I'm not clear on how to do this, and haven't tried to investigate! Setting bit 5 to '0' means use the frequency derived from the tone and octave settings of channels 1 (envelope on 2) or channel 4 (envelope on 5). The lower the frequency, the 'slower' the envelope - in other words, the effect takes longer to happen. Bit 6 can be anything, and bit 7 tells the chip whether the envelope is to be used for the channel, or whether the normal sound is to be used.

Envelope control is not one of my strong points - and you don't need to understand it to make use of the chip!

NB. When using one of the single decay or attack envelopes, you will need to output an identical envelope setting before playing the next note. Refer to the procedures in the program called ENVELOPE, ENVELOPEOFF and CALCENVELOPE.

THE PROGRAM

Right, here is the program I've talked about. By playing around with it I'm sure you will soon see how things work.

```
 10 REM Tunes package
 20
 30 Setup
 40 MODE 3: CLS #: LIST 50 TO
    230
 50 FOR n=0 TO 5:volume n,255:
     NEXT n
 60 note 1,b:octave 1,3:enable
    5
 70 ON ERROR GO TO 100: REM Er
    ror when data out
 80 RESTORE
 90 DO : READ n,del:note 1,n:
    PAUSE del: LOOP
100 ON ERROR STOP : disable 1:
    major c:enable 3,4,5: PAUS
    E 100
110 major g:major gs:major a:m
    ajor as:major b
120 major c:major cs:major d:m
    ajor ds:major e
130 major f:major fs
140 disable 3,4,5
150 volume 2,255:note 2,c:octa
    ve 2,3: PAUSE 50
160 note 1,0:octave 1,0
170 calcenv 5,0,4: LET xx=EnvV
    al
180 envelope 0,xx:enable 2
190 PAUSE 200:octave 1,2: PAUS
    E 200:quiet
200
210 DATA b,10,c,10,cs,10,d,10,
    ds,10,e,10
220 DATA f,10,fs,10,g,10,gs,10
    ,a,10,as,10
230 DATA c,50,e,50,g,50,a,50,f
    ,50,c,100
240
250 REM ************************
260 REM *                      *
270 REM *   SAM SOUND Demo     *
280 REM *  Music Procedures    *
290 REM *                      *
300 REM *   David  Stewart     *
310 REM *                      *
320 REM ************************
330
```



```
340
350 REM
360 REM Procedures (see articl
    e for details)
370 REM
380 REM CHIPON
390 REM CHIPOFF
400 REM NOTE      channel,notev
    alue
410 REM VOLUME    channel,volum
    evalue
420 REM OCTAVE    channel,octav
    evalue
430 REM ENABLE    channel[,chan
    nel...]
440 REM DISABLE   channel[,chan
    nel...]
450 REM NOISEON   channel[,chan
    nel...]
460 REM NOISEOFF channel[,chan
    nel...]
470 REM QUIET
480 REM NOISEZERO noisegenzero
    value
490 REM NOISEONE  noisegenonev
    alue
500 REM NOTEVALUES
510 REM SETUP
520 REM CALCENV type,lr,resoul
    tion (result in EnvVal)
530 REM ENVELOPE num,value
540 REM ENVELOPEOFF num
550 REM MAJOR chordbase
560 REM MINOR chordbase
570
580
590 DEF PROC CHIPON: SOUND 28,
    1: END PROC
600
610 DEF PROC CHIPOFF: SOUND 28
    ,0: END PROC
620
630 DEF PROC NOTE nchannel,nva
    lue
640 IF nchannel<0 OR nchannel>
    5 THEN GO TO 670
650 LET Notes(nchannel+1)=nval
    ue
660 IF nvalue THEN SOUND 8+nch
    annel,nvalue: ELSE Volume
    nchannel,0
670 END PROC
680
690 DEF PROC VOLUME vchannel,v
    value
700 IF vchannel<0 OR vchannel>
    5 THEN GO TO 730
710 LET Vol(vChannel+1)=vvalue
     MOD 16
720 SOUND vchannel,(vvalue MOD
     16)*16+(vvalue MOD 16)
730 END PROC
740
750 DEF PROC OCTAVE ochannel,o
    value
760 IF ochannel<0 OR ochannel>
    5 THEN GO TO 800
770 LET Oct(oChannel+1)=ovalue
     BAND 7
780 LET ovalue=Oct((ochannel B
    AND 14)+2)*16+Oct((ochanne
    l BAND 14)+1)
790 SOUND 16+(ochannel DIV 2),
    ovalue
800 END PROC
810
820 DEF PROC ENABLE DATA
830 LOCAL echan
840 DO WHILE ITEM<>0
850 READ echan: IF echan<0 OR
    echan>5 THEN GO TO 870
860 LET ChannelValue=ChannelVa
    lue BOR (2↑echan)
870 LOOP
880 SOUND 20,ChannelValue
890 END PROC
900
910 DEF PROC DISABLE DATA
920 LOCAL dchan
930 DO WHILE ITEM<>0
940 READ dchan: IF dchan<0 OR
    dchan>5 THEN GO TO 960
950 LET ChannelValue=ChannelVa
    lue BAND (63-2↑dchan)
960 LOOP
970 SOUND 20,ChannelValue
980 END PROC
990
1000 DEF PROC NOISEON DATA
1010 LOCAL nchan
1020 DO WHILE ITEM<>0
1030 READ nchan: IF nchan<0 OR
     nchan>5 THEN GO TO 1050
1040 LET NoiseValue=NoiseValue
     BOR (2↑nchan)
1050 LOOP
1060 SOUND 21,NoiseValue
1070 END PROC
1080
1090 DEF PROC NOISEOFF DATA
1100 LOCAL nchan
1110 DO WHILE ITEM<>0
```

```
1120 READ nchan: IF nchan<0 OR
     nchan>5 THEN GO TO 1140
1130 LET Noisevalue=Noisevalue
     BAND (63-2↑nchan)
1140 LOOP
1150 SOUND 21,NoiseValue
1160 END PROC
1170
1180
1190 DEF PROC QUIET
1200 LOCAL n
1210 FOR n=0 TO 5:volume n,0: N
     EXT n
1220 END PROC
1230
1240 DEF PROC NOISEZERO valueze
     ro
1250 IF valuezero<0 OR valuezer
     o>3 THEN GO TO 1280
1260 LET NoiseGenZero=valuezero
1270 SOUND 22,NoiseGenOne*16+No
     iseGenZero
1280 END PROC
1290
1300 DEF PROC NOISEONE valueone
1310 IF valueone<0 OR valueone>
     3 THEN GO TO 1340
1320 LET NoiseGenOne=valueone
1330 SOUND 22,NoiseGenOne*16+No
     iseGenZero
1340 END PROC
1350
1360 DEF PROC NOTEVALUES
1370 REM Note values for sound
     chip
1380 LET B=5,C=33,Cs=60,Db=60,D
     f=60
1390 LET D=85,Ds=109,Eb=109,Ef=
     109,E=132
1400 LET F=153,Fs=173,Gb=173,Gf
     =173,G=192
1410 LET Gs=210,Ab=210,Af=210,A
     =227,As=243
1420 LET Bb=243,Bf=243
1430 END PROC
1440
1450 DEF PROC SETUP
1460 LOCAL n
1470 LET ChannelValue=0,NoiseVa
     lue=0
1480 LET NoiseGenZero=0,NoiseGe
     nOne=0
1490 SOUND 20,ChannelValue;21,N
     oiseValue
1510 NOTEVALUES
1520 DIM Oct(6),Vol(6),Notes(6)
1530 FOR n=0 TO 5:OCTAVE n,2:VO
     LUME n,0:NOTE n,c: NEXT n
1540 CHIPON
1550 DIM Notevals(12)
1560 LET Notevals(1)=c,notevals
     (2)=cs,notevals(3)=d,notev
     als(4)=ds
1570 LET Notevals(5)=e,notevals
     (6)=f,notevals(7)=fs,notev
     als(8)=g
1580 LET Notevals(9)=gs,noteval
     s(10)=a,notevals(11)=as,no
     tevals(12)=b
1590 END PROC
1600
1610 DEF PROC CALCENV type,lr,r
     es
1620 REM Type   0 Zero Amplitude
1630 REM        1 Maximum Amplit
     ude
1640 REM        2 Single Decay
1650 REM        3 Repetitive Dec
     ay
1660 REM        4 Single Triangu
     lar
1670 REM        5 Repetitive Tri
     angular
1680 REM        6 Single Attack
1690 REM        7 Repetitive Att
     ack
1700 REM Lr     Left/right envel
     opes: 0 identical 1 invers
     e
1710 REM Res    Resolution  3 or
      4 bit
1720
1730 REM Envelope controls chan
     nels 2 and 5
1740 REM Clock controlled by No
     te & Octave of Channels 1
     & 4
1750
1760 IF type<0 OR type>7 THEN L
     ET envval=0: GO TO 1780
1770 LET EnvVal=(lr=1)+Type*2+(
     Res=3)*16+128
1780 END PROC
1790
1800 DEF PROC ENVELOPE num,envv
     alue
1810 IF Num<0 OR num>1 THEN GO
     TO 1830
1820 SOUND 24+num,envvalue
1830 END PROC
1840
1850 DEF PROC ENVELOPEOFF num
```



```
1860 IF num<0 OR num>1 THEN GO
     TO 1880
1870 SOUND 24+num,0
1880 END PROC
1890
1900 DEF PROC MAJOR base
1910 LOCAL value,baseloop
1920 LET value=-1
1930 FOR baseloop=1 TO 12
1940 IF notevals(baseloop)=base
      THEN LET value=baseloop-1
1950 NEXT baseloop
1960 IF value=-1 THEN GO TO 200
     0
1970 note 3,notevals(value MOD
     12+1)
1980 note 4,notevals((value+4)
     MOD 12+1)
1990 note 5,notevals((value+7)
     MOD 12+1)
2000 END PROC
2010
2020 DEF PROC MINOR base
2030 LOCAL value,baseloop
2040 LET value=-1
2050 FOR baseloop=1 TO 12
2060 IF notevals(baseloop)=base
      THEN LET value=baseloop-1
2070 NEXT baseloop
2080 IF value=-1 THEN GO TO 200
     0
2090 note 3,notevals(Value MOD
     12+1)
2100 note 4,notevals((value+3)
     MOD 12+1)
2110 note 5,notevals((value+7)
     MOD 12+1)
2120 END PROC
2150 PALETTE 2,99: PRINT #0; PE
     N 2; AT 0,8;"Press B to en
     ter BASIC or any other to
     exit..": GET K$: IF K$="B"
      OR K$="b" THEN STOP
```

AND FINALLY

With the possible exception of envelope control, the SAA1099 is a very easy chip for anyone to program. Hopefully the above text and the examples given by the procedure in the program will make everything clear.

I hope this will give a few people just the incentive they need to get involved with the SAM sound chip.

FORMAT

SAM REPAIR SERVICE

We are pleased to be able to offer readers an official, West Coast approved, repair service for SAM Coupé and SAM élite computers and add-ons.

PRICING Because every fault is different we can't guarantee a fixed rate. When we receive your machine it will be tested and, if it is going to cost more than £35 for the repair then we will contact you for authority to continue.

Pack your machine well (we will use your packing for its return). Please phone us on 01452-412572 for advice on dispatch (we can even arrange UK Mainland collection and overnight delivery for an extra £12.95). In many cases we can also give an estimate over the phone. All repairs returned by overnight carrier so tell us which days there will be someone in to sign for the parcel. Please quote your INDUG membership number and give a evening contact phone number.

Send your machine to:-

Format (SAM Repairs),
34, Bourton Rd, Gloucester, GL4 0LE.

SPECIAL OFFER

If you followed our recent SAM C series do not already own a copy of SAM C from Fred Publishing then now is the time to get your copy.

In conjunction with Fred Publishing we are making an extra special offer to ***FORMAT*** readers which allows you to order a copy of SAM C direct from us at

HALF PRICE!!!

Just send a cheque for ***£10*** (overseas customers £12) to us at Format Publications and we will send you the full version of SAM C complete with manual, so you can start learning this powerful language.

Do not send your orders to FRED, this offer is only available from us by mail-order.

SAM élite 512

FEATURES INCLUDE

512K RAM
32K ROM
800K Floppy Disc Drive
6 Channel Stereo Sound
8 Bit 6MHz Processor
Joystick Ports
Midi & Network Ports
128 Colours
4 Screen Modes
SCART Output

The advanced computer that retains the ease of use and speed which makes even the beginner feel at home. An easy to learn Basic and for operating ... with drop down menus and windows ... helps you never be more than a few clicks away from the help you need.

Your SAM comes with a very easy to read ... everything you need to get started - it even has some ... software for you to run just to ...

If you already own a Spectrum ... for you because you don't have to throw away all you ... prepared to be amazed at the extra power and features

ONLY £199.95

POWER AT A PRICE YOU CAN AFFORD

Reconditioned SAM Coupé

... The Features Of The SAM ...

SAM Coupé computers. These have been ... and are supplied with ... version 3 ROM, new keyboard unit, and are supplied with ... day full return ...

ONLY £149.95

SAM Coupé Replacement Disc Drives

The original slot-in slimline drives produced for the SAM ... are no longer made. If your existing drive is now ... perhaps it is time you gave ... case of the ...

... cases we find the faults ... are a mechanical ... due to worn heads, stepper motor failure, etc. In these cases ... need an internal interface Type 1 to which you transfer the ... 772 disc controller chip from your old drive - thus making the ...

For the kit you will need screwdriver, soldering iron, solder and a reasonable level of soldering skills. All you need for the ... given and the only other thing you ... disc drive from your local supplier (cost about £20 to £25)

If you have any doubts about which type of interface you need ... any questions about the drive fitting in general, then please ... FORMAT hotline ... on 01452 412572 and they will ...

	Kit Form	Assembled
Internal Disc Interface Type 1	£19.95	£29.95
... Disc Interface Type 2	£34.95	£44.95

INTERFACES

These ... unless otherwise stated

SAM MOUSE SYSTEM ... the interface ... SAM so you don't need ... spare expansion slot. ... works better if you use a mouse *Only £39.95*

SAM PRINTER INTERFACE ... The Spectrum ... PRINT ... AMP connector ... (see below). *Only £24.95*

TWOSER ... Allows two interfaces to be connected to SAM's expansion port at same time. *Only £19.95*

... the eXternal Disc Interface. Allows external 3½" ... drive to be connected to SAM Coupé. Also ... includes Parallel Printer Interface *Only £44.95*

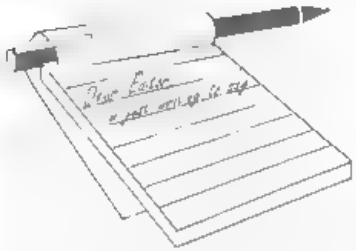
... Amiga Mouse Adaptor £7.95, SCART ... £7.95, Replacement Keypad £14 ... Power Supply please ring for ... you want. We will ...

Ordering: Write your order clearly, state your name, full address and phone number and if possible please quote your INDUG number as this will help to speed orders. Payment: Cheques and UK Postal Orders should be made payable to FORMAT PUBLICATIONS. Overseas customers may also pay using FORMAT's foreign exchange scheme ... Please add £1 per title UK p&p. Overseas ... per item. Please allow ... for delivery ...

Send Your Orders To

West Coast Mail Order
c/o Format Publications
34, Bourton Road,
Gloucester
GL4 0LE

West Coast Computers



YOUR LETTERS

Dear Editor,

After reading Roy Burford's letter I tried demagnetising a disc to remove a sector error and was able to re-format it on the first try.

If you are looking for a hand held eraser what you should be asking for is a *CRT Degaussing Wand*, this is used by a TV service man to demagnetize the metallic internal parts of a picture tube in much the same way as you described the operation of your demagnetizer. If readers want to demagnetise a disc I would suggest you ask your local TV repairers for help.

I read with interest your article on SAM the future and I agree with statements 1 and 2

I can see that ULA failure in a Spectrum will become unrepairable. The only supplier I can find is charging £40 postage !

It is important to maintain compatibility with Spectrum software to allow a Spectrum owner to upgrade to a SAM and be able to use both tape and PLUS D discs. The ability to use a PLUS D drive as a second drive would be useful.

Like most Spectrum owners I have a lot of magazines with listings I think could be useful so I am filling a disc

I have replaced the tape syntax in TW2 with disc syntax and I also use a menu program so that when the disc is booted you will be able to run the programs I send. The file names of runable versions will be in capitals and will be followed by text filing explaining them.

Where they use machine code I will include the basic listings to poke them into memory. In this way if any machine code files get corrupted you will be able to recreate them

Yours sincerely, I.H.Bailey.

I have not come across a 'degaussing wand' before, but I will start searching for one when I have a few minutes to spare, and of course I will let readers know if I find something affordable

Thanks for your input on the SAM front, your comments, and those of others, are very useful to me.

And thanks for the offer on the programs, look forward to seeing what you have. ***Ed.***

Dear Editor,

Following our conversation at the last Gloucester show, where I approached you concerning the difficulties experienced with printing from several of my software programs. You proposed that the trouble lies with the fact that my printer set up was in serial and not in parallel

I have a SAM Coupé with a Citizen 120D nine pin dot printer connected through the SAM Comms Interface and was finding that programs which checked if the printer was on line would not accept this fact, although when the program crashed any LPRINT message was printed by the printer

I know that the SAM Coupé is very versatile and with a little look at the program in detail I discovered that the printer check routine used the Port address of 233 and all I had to do was alter it to 231 and the program worked without any hitch. The actual lines were `LET pr= IN 233 BAND 1` thus altered to `LET pr= IN 231 BAND 1` solved the

problem.

This has not solved all the problems on other software but then I shall probably have to purchase an up-to-date printer with a parallel connector. I find that the Citizen 120D's Printer Interface Cartridges are not available at the present time.

Yours sincerely, John Thornborrow.

Well done John, glad you have some of the stuff working. I'm still trying to get hold of a parallel interface for you, so don't give up hope yet. ***Ed.***

Dear Editor,

It is quite a while since I wrote to you last, about the time that the SAM Adventure Club faded out. I was very sorry to see that go, I really loved playing all those adventures, most of the good ones were on the Spectrum. I have still got loads of them on Microdrive, some of which I think I managed to transfer to SAM. Must have a look at what I have got.

It was the letter from Jenny Bundock (not your Jenny?) which prompted me to write, asking if anyone had any pokes for 'The Prince of Persia'.

Yes, I have and probably you will get a number of other readers sending in the same program. To be quite honest I cannot remember where I got this program from. I seem to remember typing it in from some magazine, but I can't remember which!

Anyway I am sending a SAM disc with the program on it, which explains itself, along with a listing from the tape and also a typed version of the program which is easier to read.

You must of course have the Prince tape, and don't forget to run the pokes tape first, using SAM's F9 key.

Yours sincerely, Wilf Smith.

If you are into adventures Wilf, then you will be interested in the item on the 1998 convention in Birmingham this October, well worth a visit.

And yes, it was our Jenny, she gets into everything these days. Many thanks for helping her. (Anyone else need a copy?) ***Ed.***

Dear Editor,

Thank you for your reminder, I had been meaning to get in touch for some time but have been continuously busy ever since I retired 22 years ago and have missed your magazine.

Even now I am not too sure whether I shall have the time to read it but will give it a try.

I have become slightly involved with Windows in the past year, but there are so many options that even the simplest task becomes complicated and I am much happier with my SAM Coupé and Basic. The memory requirement is so much more economical!

It has been essential for work which I have done with the accounts for our small parish Church and I have developed a double entry book keeping program which I claim is truly user friendly if anyone is interested.

My congratulations on keeping going for so long and my best wishes for the future.

Yours sincerely, T.A.Mugford.

Welcome back Tony. Pleased to hear about your book keeping program, would love you to write something on the subject. ***Ed.***

Dear Editor,

First, I lost my copy of 'Overseas exchange rate list' so I used £1 = 300 Escudos! I hope that everything is okay with it. If the payment is more than that please tell me and I send to you the necessary!

Second, can you send me a copy of FORMAT PC?

Third, answering what I like to see in ***FORMAT***, I have some absurd ideas:

1. Is it possible to link two SAM's in Internet - not working in internet but pass by internet?

2. Just like first one, Is it possible to connect a SAM to a modem? and then via phone link?

3. Is it possible for a SAM to format discs that a PC can read? and visa versa, a PC format SAM Discs? (Just for backup's for example, format and read/write!).

4. I know there's a way to use a hard disc with SAM for mass save, but it's too difficult to find hard discs with only a few MB. Is it not possible to link SAM and a PC and use the PC like 'storage'.

5. When did you tell ***FORMAT*** readers the list of sites for SAM!?! What about examining some of them!

6. This very particularly, I have a Seikosha SP-1900+ and I would like to link it with SAM. Can you help me?

Ok, I suppose that my ideas are very absurd, but the last time I read ***FORMAT*** you were speaking about the future of SAM. In my case I work with PCs, SAM is just a hobby and I'd like to do smaller things with it, like smaller programs and small pieces of hardware. Please don't interpret me wrong, I understand the necessity of selling SAM and its hardware but for me the mystic (charisma) of SAM is that I can do things with it and I can do myself! Hope you understand.

Sorry about my English.

Yours sincerely, Joaquin Batista.

Joaquin, you can be sure of one thing, your English is miles better than my Portuguese – in fact I am ashamed to admit that I do not know a single word of your language.

Anyway. Dealing with each of your points in turn.

1 & 2) At the moment, no. Well, in theory it can be done but in practice it would just be too much hard work at the moment. A modem has always been high on my list of projects fro SAM, but that enthusiasm has not yet inspired someone to design one. Blue Alpha did try some years ago, but never solved the problem.

3) Yes, you can format a PC disc on SAM using PC-Suite from SD Software. This software also allows you to convert files between the two machines and to convert a SAM program into text so that you can transfer it to a PC for editing or printing, and then re-convert it back to a SAM Basic program if you want to.

4) The very first SAM hard drive I saw was an Amstrad 286 computer linked via a serial cable to SAM. On the 286 simple software controlled the link and SAVEd/LOADed files on the Amstrad's hard drive.

Having said that, there are still a lot of smaller drives around, say 50 to 500 Meg. And remember that SD's interface will handle even very big drives if you want it to.

There are a few sites on the World Wide Web with SAM information on them. However, they tend to be rather out of date, and few contain any information of any value. We are considering our own site, not just for SAM but for the Spectrum as well, so what would you (and other readers with web access) like to see on-line?

6) If the SP-1900+ is a parallel printer then all you need is a printer interface for your SAM. The more Epson compatible it is the less work you will have to do to get it to work with commercial SAM software, but in the end you should be able to use it with SAM. ***Ed.***

Dear Editor,

I would certainly buy a Spectrum hard drive interface if it was below £100 even if the DOS was only partially completed, once the hardware is in place software soon catches up.

Yours sincerely, Bernadette Dowsland.

I know you Bernadette, you would buy anything for your Spectrums. It warms my heart to see such devotion.

You will be pleased to know that your's was not the only message in a similar vain that we received. As a result, well, lets say we are looking at it. ***Ed.***

Dear Editor,

What would I like to see covered in a future issue?

Answer - A program to convert 30% off discount on £36 into £25.20 for renewal of subscription.

Bill me if I've read it wrong!

Yours sincerely, Ewen MacDonald.

There is a term used in Internet email circles which fits this to a tee – *ROTFLOL*. Which translates to Rolling On The Floor Laughing Out Loud. Well done Ewan, that made my day. ***Ed.***

Dear Editor,

I was intrigued by the program 'Shadowizer' in the March issue of ***FORMAT*** and typed it in. I checked it thoroughly and it appears to work fine but I am puzzled by one of the lines containing the instructions. I have already telephoned but you were unable to help at the time and suggested that I write in as other readers or the author of the program Graham Burtenshaw may be able to help.

The line in question, which appears on page 19, is line number 1355 but as it is quite long I will only reproduce the part with the query. It reads:-

[...layer (when", PEN 1;"depth"; PEN 3;">1) should be spaced, V• are normally equals •" PEN 1;"dir,ydir" PEN 3;"."]

What does 'V• are normally equal•' mean? Can anyone help?

The character '•' was produced using one of the graphic characters from *The Secretary's* graphic character set. [8 across, 3 Down.] This was the nearest I could get to what looked like a large Full Stop shown on the original line.

I also found that I had to delete some spaces in the instruction lines to make them more aesthetic.

Also in the March issue was a letter from a Jenny Bundock asking about cheats or pokes for 'Prince Of Persia'. I am sure that I have seen these on a back number of SAM Supplement but I do not recall which, if I come across it I will let you know.

Thanks to Ken Powley for the warning about high density discs, I hadn't heard about the problem about the data being corrupted. I have been using HD discs as DD's were not available but I'm enclosing an order for your discs as mentioned in the latest issue.

Thanks Jenny for another interesting article about the *Millennium files*, I enclose five first class stamps for the comic version that appeared in the Dec/Jan issue of FORMAT PC.

Keep up the good work.

Yours sincerely, Colin Rout.

In short Colin, I don't know. It looks like a UDG has not been translated properly but I'm afraid I don't have time to track it through fully. I will dump a copy of the program on a disc and send it to you with this issue, maybe you will be able to find the answer and let us all know. ***Ed.***

Just a short note to pass a message on to John Fenter re letters page Vol.11 N°8 page 21. If he lives within reach of the Buckinghamshire area he is welcome to my Spectrum+, free, provided he also takes away an old 9 pin Dot Matrix printer.

Yours sincerely, John Saunders.

What a kind man, what a very kind man. I'm sure if John doesn't want it someone will. ***Ed.***

Letters may be shortened or edited to fit on these pages although we try to edit as little as possible.

This is YOUR letters page so it is up to you to fill it with interesting things. Come on, get writing, any subject even remotely related to computers. Just keep things as short as you can so we can fit in as many as possible each month. Please write clearly or type your letters. Send them to the address on page 3 or email them to us at Formatpub@aol.com.

SAM *The Future....*

By:- Bob Brenchley.

In the February issue (Vol.11 N°6) I ran an article which outlined some of the possibilities for the future of SAM. There has been some interesting feedback, some of which has appeared in the ***Your Letters*** section, and there has been some progress (painfully slow I have to admit). So I thought a second article would help to keep you up to date and clear up a few questions that I know some of you will have.

Now, a reminder of the two important points I made last time.

First. If plans go as intended, there will be a new SAM - one day. Maybe not soon, but one day.

Second, NONE of the existing owners should ever feel left out, and there should be no reason for people to delay buying an existing SAM just because there may be something round the corner. No SAM user should feel that their machine is going to be out of date.

To this I would also like to add another point which I now see as being very important. Any real development on SAM must, wherever possible, also include Spectrum users as well.

FEEDBACK

Thank you for your many letters and emails on the subject, please keep them coming as they are doing a lot to help us plan for the future.

Feedback from readers so far has fallen into three categories.

There are, admittedly, some readers who feel that SAM is now old technology and the future lies in the PC. True, there is now a good SAM emulator for the PC and if I can find someone to write them we will do a few articles on that subject in the future. But the success of the Spectrum emulators on the PC has led to many people acquiring real Spectrums because there really is no way you can beat the real thing – I think the same is true with SAM.

A second category of comments are those from SAM users who want to see new things developed. Ideas so far include: a new graphics card, modem or fast serial link to allow a standard modem to work, CD ROM, expanded memory, PC keyboard interface, voice recognition and quite a few other things.

Please, please, if you haven't written yet, please do. The more people we hear from the better. And don't say to yourself "Oh, my most wanted item is already on the list" because if we don't hear from you then your item may not get high enough on the list to stand a chance of seeing the light of day for a long time. My point is: write – we need your feedback.

Now a third category of replies have come from Spectrum users. Here we have a different set of requests. Of course the main feature asked for is more Spectrum compatibility "why can't we just switch on SAM and load/run Spectrum software" is a comment that appears in several letters. Well, I think that one will be easy to sort out, at least for 48K software. Putting the Spectrum ROM inside SAM

would only do part of the job, but there would need to be some adaptation if for no other reason than the fact that timings will need changing. However, if someone with good knowledge of the subject would like to take on the task I would be pleased to hear from you. Current best bet would be to replace the SAM ROM with a small board that holds both the SAM ROM and a modified Spectrum ROM with some suitable switching to select which is paged in.

There was also one request for an adaptor to allow Spectrum hardware to be attached to SAM. Well, such an adaptor board did exist in the early days of SAM – Bruce Gordon did one to allow certain items to be used during development work. I happen to have one, but I doubt there are more than five or six in existence. Now, bearing in mind that there may be problems with port addresses conflicting, I'm not sure what mileage there would be in making such an adaptor available to the public. Perhaps a few more people would like to comment before we go any further on that one.

PROGRESS

So far, given the turmoil of the last few months, progress has been little more than zero. The feed-back has helped in the planning stage but real work has been conspicuous by its absence.

Through an Internet mailing list there has been a lot of talk (Ok, argument is the right word) over whether a Z80 based micro would have a chance in the real world today. My answer will always be YES.

I recognise that any possible new machine that may come out of enhancing SAM will not sell in the millions like the Spectrum did - but today there is room for an affordable, expandable, programmable, usable machine - and I happen to think that the existing SAM is a good starting point towards this.

There has also been a lot of argument about wether the SAM ROM need to be reworked or not. Some feel that it would be better to concentrate on new things.

While I can see some of their points, I have to point out that these people are, in the main, people with access to powerful PCs on which to run expensive 'cross-platform' development software – something the average SAM user could not do. I would argue that until SAM itself can be used as the development machine for its software enhancements, then we are selling short existing users – something I am totally against.

A redevelopment of the SAM ROM and DOS is therefore the most important target for the moment. Other things can, and I hope will, continue along-side, but the ROM/DOS project takes highest priority for now.

So. We are still looking for details of bugs in the ROM+MasterDOS, I know I've asked several times before but the response has not been what I expected as yet. And of course I'm also looking for machine code programmers who will help with the debug process.

Right. That is all for this time. I will try to keep you updated, either through the Editorial, the Your Letter section, or through special articles like this from time to time.

Please keep your comments flowing, I do read every one that comes in and value whatever you have to say. Remember you can email me at Formatpub@aol.com, write to us at the usual address, or if you would like to chat about something why not give me a ring (evenings are best) on 01452 412572. I look forward to hearing from you.

SOFTWARE

SAM Coupé Software On 3½" Disc

PCG's DTP PACK. The famous package including WordMaster, TypeLiner & HeadLiner. Complete on disc for SAM. Includes 2 extra font packs bringing the total value to £53.40.

Order Code: SCD-04 Price: £24.95

COLOUR DUMP. Screen dump software to work with Epson compatible colour printers. RRP £12.95

Order Code: SCD-05 Price: £7.95

MasterDOS The advanced Disc Operating System for SAM. Includes random access files, sub-directories and lots more.

Order Code: SCD-31 Price: £15.95

MasterBASIC Extended Basic for SAM, works with either MasterDOS or SAMDOS.

Order Code: SCD-32 Price: £15.95

Order Both MasterDOS & BASIC Together and SAVE £5.

SAMSPEC SOFTWARE

SAM + Spectrum versions on one disc (5¼or3½

FONT LIBRARY. 100 screen fonts plus support software, easy to use on either computer. (Special 3" disc available - Spectrum files only). RRP £8.95

Order Code: SSD-01 Price: £5.95

MONEY MANAGER. Advanced personal budgeting system for both machines. Spectrum version needs 128K/+2 (not +2a or +3). RRP £15.95

Order Code: SSD-02 Price: £9.95

SPECTRUM SOFTWARE

Unless otherwise indicated these are DISCiPLE/PLUS D programs. Please state 3½" or 5¼" disc (80 track only) on order.

ARTIST 2. The best art package ever written for the Spectrum. 48K and 128K versions on the same disc. With page-maker and utility software. Full manual. RRP £19.95

Order Code: SPD-01 Price: £12.95

UTILITY DISC #1. Six of the best and most useful disc utilities for DISCiPLE or PLUS D. Added bonus program - not to be missed. RRP £9.95

Order Code: SPD-02 Price: £6.95

PCG's DTP PACK. The famous package including WordMaster, TypeLiner & HeadLiner. Includes 2 extra font packs bringing the total pack value to £53.40.

Order Code: SPD-04 Price: £24.95

+3 Version: SPD-04C Price: £29.95

3½" DS/DD BLANK DISCS

Good quality 80 track DS/DD 3½ inch disc, suitable for DISCiPLE, PLUS D and SAM. Sold in packs of ten with labels. (Overseas customers please add £1.50 postage not 10% as on other items.)

Order Code: DSDD10 Price: £3.75

FORMAT READERS SERVICES

FORMAT BACK-ISSUES

Volumes 1, 2 and 3 are now out of print. Volumes 4,5,6,7 and volume 8 are available as complete volumes. Order by giving the Volume N° (i.e. V5).

Price: £14.00 per volume.

All issues, from Volume 8 N° 1 (September 1994) to the latest issue, are available separately. To order just quote the Volume and Issue N°.

Price: £1.75 each, (5 or more £1.50 per copy).

HARDWARE

DUC LEAD For use with DISCiPLE or PLUS D. This 'Dualing Up Cable' allows two disc drives to be attached without the need for opening one drive to alter its ID. Allows you to switch drives to even out wear without opening cases. RRP £16.95

Order Code: DUC-01 Price: £11.95

PRINTER LEAD. Top quality parallel printer lead (BBC standard). 1½ metres long (approx). For use with DISCiPLE, PLUS D or SAM. RRP £10.95

Order Code: PPL-01 Price: £7.95

+3 PRINTER LEAD. For +3 or +2a. RRP £12.95

Order Code: PPL-02 Price: £9.95

SAM COUPÉ TECHNICAL MANUAL Version 3.

The real inside info on SAM. No SAM is complete without one. RRP £16.95

Order Code: STM-01 Price: £12.95

SAM_CLOCK

The SAM_CLOCK is fully compatible with the TIME and DATE functions of MasterDOS and has an integral battery that keeps the board functioning when your SAM is switched off. The board fits onto the expansion connector at the back of SAM but comes with a built-in through-connector so you don't need a Two-Up to use it in conjunction with another interface. R.R.P. £29.95

Order Code: SCH-01 Price: £24.95

ORDERING All prices include UK p&p, overseas readers please add 10% to for extra postage.

Clearly state Order Code, Product description, Quantity required and Price. Remember to add any postage and don't forget your Membership Number or we can't process your order. Payment in STERLING by Cheque (drawn on a UK bank), P.O. Euro Cheque or Cash. Make cheques payable to FORMAT. Payment MUST be in same envelope as order. Send to FORMAT's address on page 3. Normally dispatch is at the same time as your next issue of *FORMAT*. We will not be held liable for delays or non-delivery due to circumstances beyond our control.

DO YOU HAVE A FRIEND WHO IS LOOKING FOR THE VERY BEST IN

SAM, Spectrum or PC

SUPPORT?

THEN TELL THEM THEY NEED

NO FURTHER

Just send us their name and address and we will send them the details of INDUG membership and all we have to offer.

Go On, Do Your Friend A Favour - And Yourself.

INDUG

The INDEPENDENT User Group

℅ FORMAT PUBLICATIONS, 34, Bourton Road, Gloucester, GL4 0LE.
Telephone: 01452-412572. Email: FormatPub@aol.com

Vol.11 №10. June 1998.

FORMAT

THE *HOME* OF Z80 COMPUTING

Relax, And Enjoy A Summer With ***FORMAT.***

£2.00 (UK R.R.P.)

ISSN 0963-8598.